

AGENDA:

1. Dimensions and Constraints
2. Selecting and Manipulating Content
3. Editing Tools

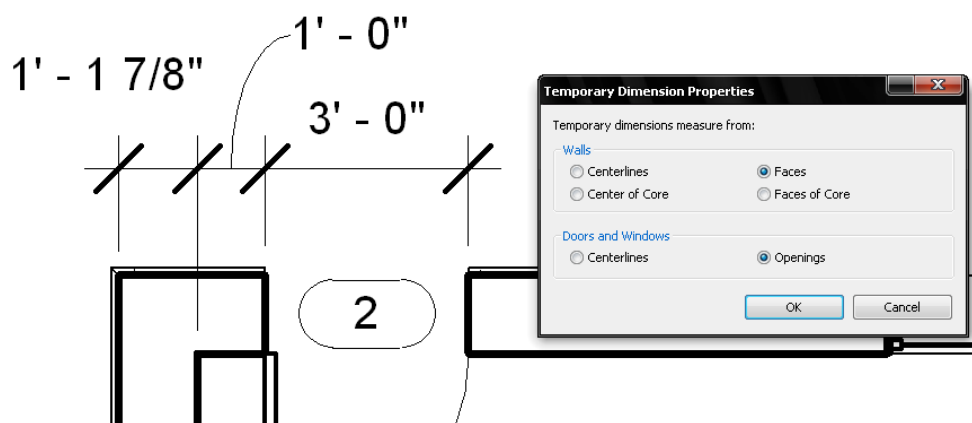
1. Dimensions and Constraints

Dimensions are elements which report sizes and distances in individual views. Dimensions show only in the view in which they were created although they may be duplicated when creating a new view from an existing view by selecting the Duplicate with Detailing option.

Constraints are non-view specific elements that allow you to create and lock in relationships between elements. Constraints may be defined with dimensions such as locked distances or equal values, or with other tools such as Align. Constraints defined with dimensions may be retained even when the associated dimensions are deleted.

There are two types of dimensions in Revit: Temporary and Permanent. Temporary dimensions appear as you are placing content or when an element is selected. Permanent dimensions are created by picking points or by converting a temporary dimension.

Temporary dimensions react by default with elements according to the values specified in the Temporary Dimension

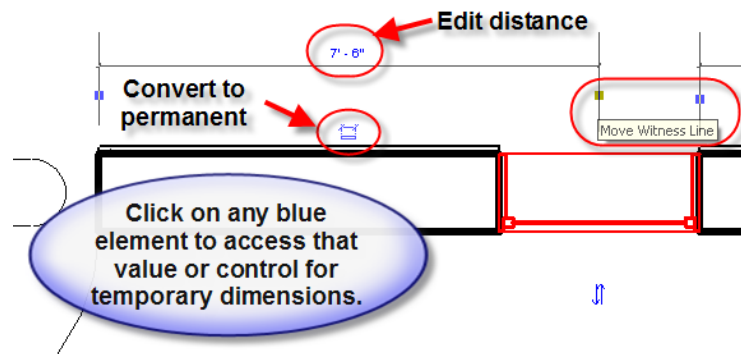


Properties dialog accessed from the Additional Settings pulldown on the Manage tab of the Ribbon.

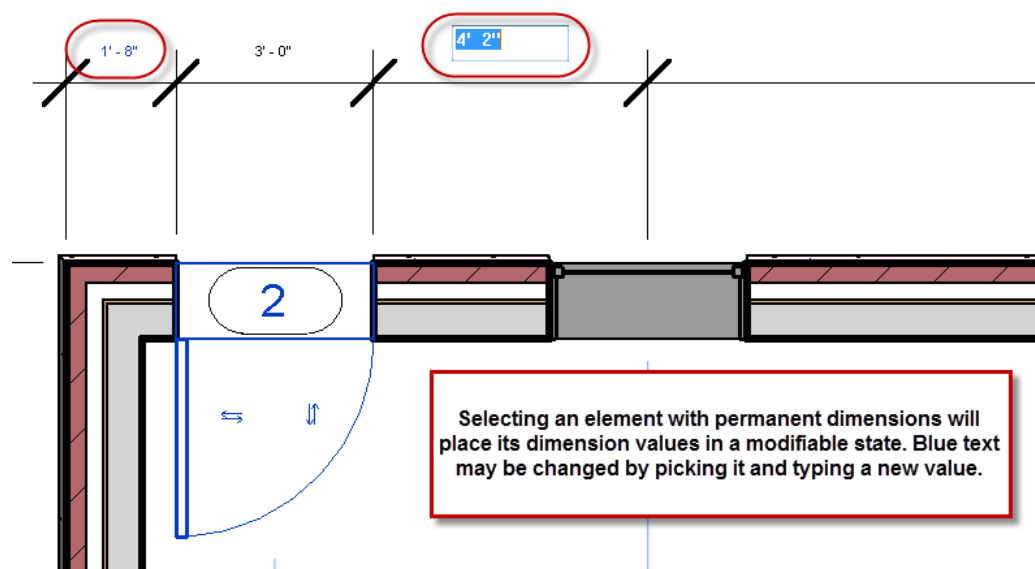
These settings can easily be overridden by moving the witness lines for temporary dimensions.

Selecting a component or element in the drawing will display the temporary dims for that element. If you pick the Dimension value, you can type in a new value and the selected object will move to reflect the new distance. If the witness line for the dim is not attached where you want it, you can move the witness line by picking the blue control box on the witness line, or by picking and dragging it to a new position. To convert a temporary dimension to a permanent one, pick the blue dimension symbol below the dimension.

Temporary dimensions display only when a single element is selected. It is possible to force the display of temporary dims for multiple objects by selecting 2 or more elements and then choosing Activate Dimensions on the Options bar. This will decrease performance.

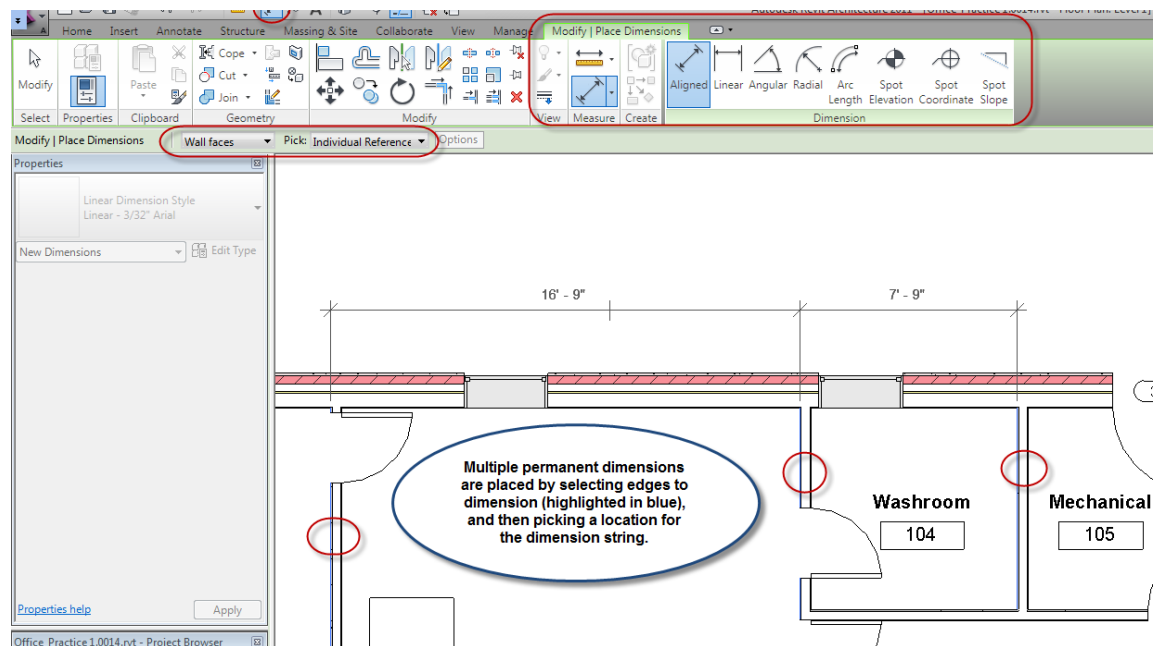


Permanent dimensions are specifically created or placed and may appear in a modifiable or non-modifiable state. To make a permanent dimension modifiable, select the geometry which it references. Values that can be changed will display in blue. Picking the blue text will highlight the value and let you change it. This will move the selected element.



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Permanent dimensions may be placed with the Dimension Tools accessed from the Quick Access toolbar, various tabs on the Ribbon, or with the keyboard shortcut, DI. On the Ribbon's dimension panel, found on the Annotate tab, select the type of dimension you wish to create: Aligned, Linear, Angular, Radial, or Arc Length. Next, on the Option Bar, set the Prefer pulldown option to Wall Faces, Wall Centre lines, Faces of Core, or Center of Core depending on where you want the witness lines to be placed. Set the Pick field to Individual References. Select each element face or center to dimension and then pick a point to set the dimension location.

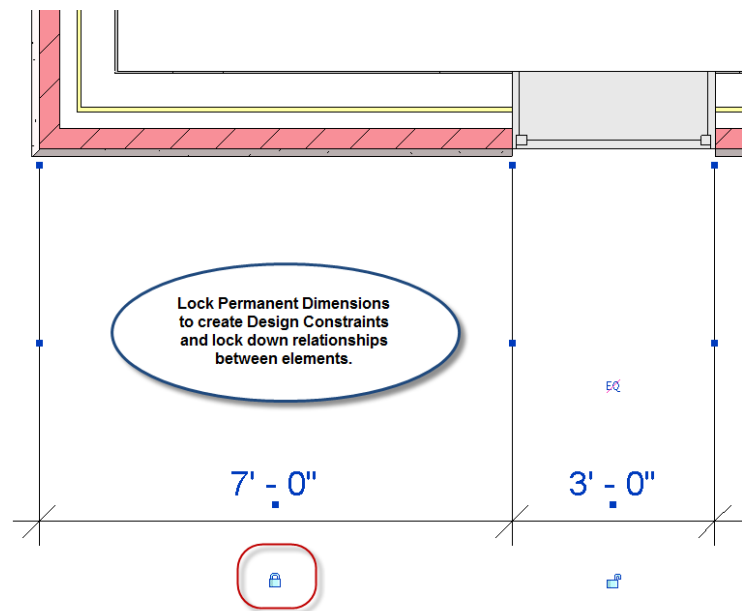


If more than one possible witness origin point is in the same area, you can toggle between them by floating your cursor over the area and pressing TAB until the desired origin reference is highlighted in a grey color, and then pick to select that reference.

Automatic Aligned Dimensions allow you to dimension one or more walls, including offsets, openings, intersecting walls, and intersecting grids in a single step. To create automatic dimensions, start the Dimension command and on the Options bar set the Prefer field as required, set the Pick field to Entire Walls, and then choose the Options button to set the Auto Dimension Options to enable dimensioning of openings, intersecting walls and / or intersecting grids as well as opening options such as Centers or Widths. Pick ok, select the wall or walls to dimension and then pick point for the Dimension location.

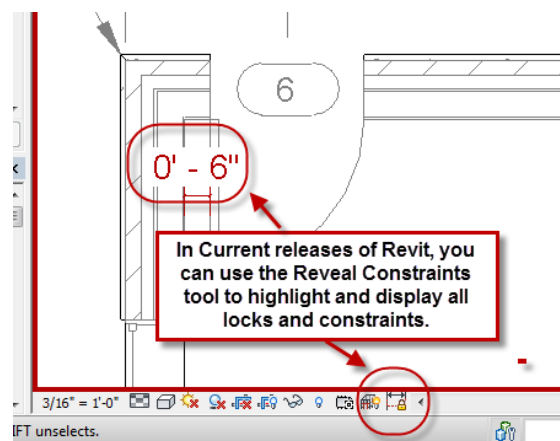
After you place any permanent linear or angular dimensions, a padlock icon will appear below each dimension segment. If you pick this symbol you can open and close the lock.

Locking a dimension segment will create a design constraint between the two elements which are being dimensioned, making it impossible to change the distance between those two elements without removing this constraint.



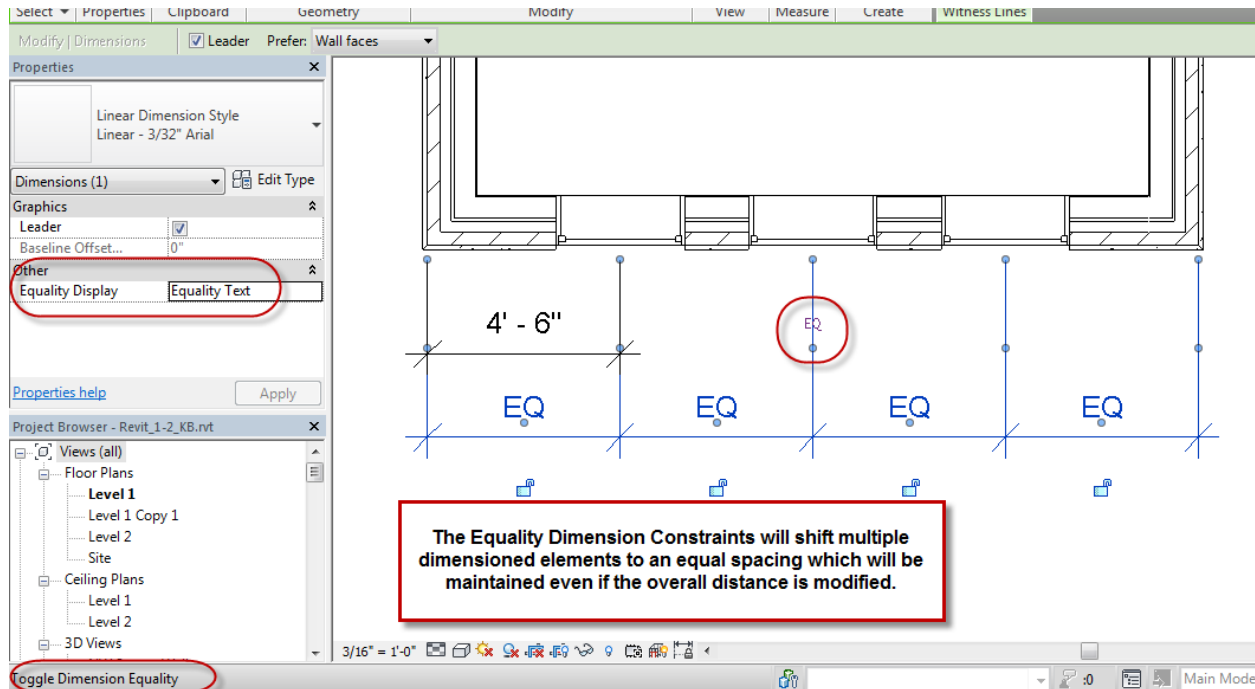
If you add a lock to a dimensioned element, it will create a constraint that can be retained even if you delete the dimension. This is not usually recommended as it can lead to an over-constrained model. If you select any constrained building element, it will display lock symbols and alignment lines to help show the source of the constraints.

In current versions of Revit, you can use the Reveal Constraints tool found on the view control bar to highlight all of the constraints in the model in red, even if the constraints have no visible associated dimensions.



It is not necessary or desirable to lock every dimension you create. Only add locks to critical dimensions where you need to establish a design relationship or you want to keep something from moving. The more constraints and locks you create, the more complex the project will become increasing the chance of design conflicts appearing while you work. Think of constraints as a temporary measure and delete them when you no longer need them.

A second type of constraint which may be created with dimensions is the Equality constraint which will appear as an EQ with a line through it when you create or select a multi-segmented dimension. Picking the EQ symbol will change all of the dimension values to EQ and will move all of the dimensioned elements so the distances between them are equal. This equality relationship will be maintained even when the overall distance changes.



If you assign equal constraints to a set of dims, but still want to display the actual dimension values instead of the EQ symbol, select the dimension, and in the Properties palette, set the Equality Display to value. It is possible to add a lock to a dimension that is also equally constrained.

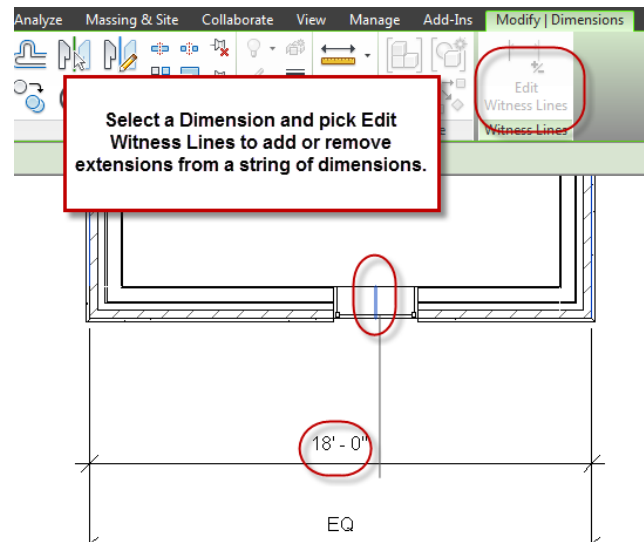
To remove equality constraints from a dimension, select the dimension and then pick the EQ symbol to toggle the equality constraint off. The equal spacing will be maintained unless the overall distance is modified.

Selecting a constrained object will display the constraint references as dashed lines. To hide the display of Constraints, type VG to open the Visibility / Graphic overrides dialog and in the Annotation Categories tab, clear the checkmark under visibility for the Constraints category

You can move a witness line for a permanent dimension by selecting the dimension and then picking or picking and dragging on the blue control box on the witness line. To change the Witness line gap for a dimension, pick and drag the blue control box at the end of the witness line.

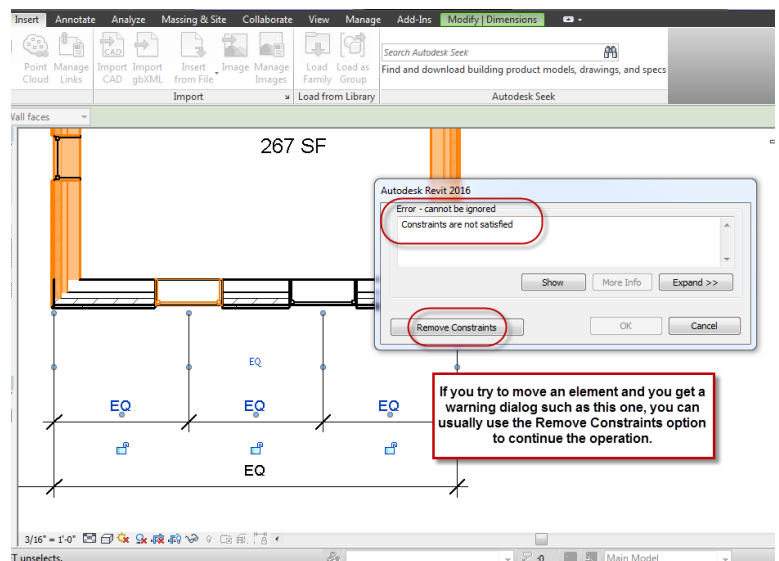
To add or delete witness lines from a dimension, select the dimension and on the Ribbon, choose Edit Witness Lines.

When you are Adding and Deleting Witness Lines, all of the reference points for the selected dimension will be shown in blue. Picking one of the blue lines will delete that witness line. To add a new witness line, select a new reference edge or point and a new blue line will appear along with the new witness line.



To reposition a dimension text value, select the dimension and then pick the blue control box below the text. On the Options bar you can choose to draw a leader from the text to the middle of the dimension line.

In current versions of Revit, it is possible to add additional text above, below, before, or after the default dimension text value. It is even possible to replace the true dimension text value with your own static text entry although this will generate a warning. To add text or replace the default dimension text, select a dimension and then pick one of the dim text values to open the Dimension Text dialog. Add or replace text elements as required and pick OK.



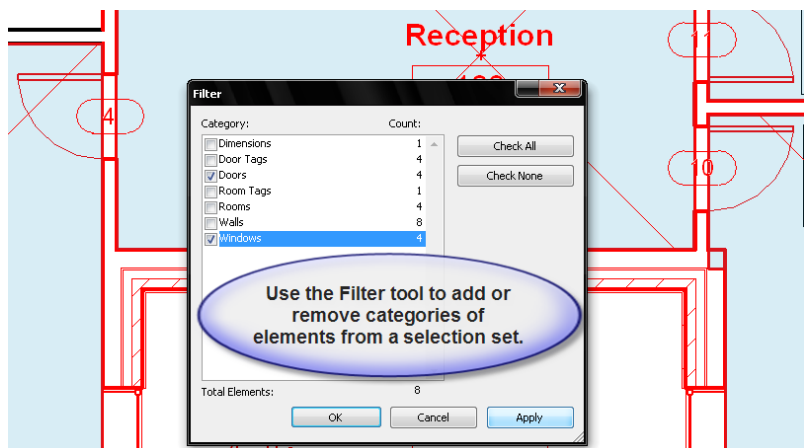
2. Selecting and Manipulating Content

Many of the methods used for editing an element are only available when an object is selected. To aid in selecting objects, Revit highlights objects when you float your mouse over them and a tooltip appears identifying the object that will be selected if you pick it.

If several items are in the same area, presses TAB to cycle the selection until the desired element is highlighted and then pick it to make the selection.

When you select an object, it will change color, any element specific editing controls and dimensions display on or near the element, applicable editing tools become available on the Modify panel or the Right-click menu, and the Selection Control in the Properties Palette will display the number of selected elements. The Ribbon will also show a "Modify_Element" tab with appropriate tools.

If you select multiple elements with a crossing or window selection and then pick the Filter icon from the Selection panel on the Ribbon, it will open the Filter dialog showing a list of all selected categories and the number of elements in each of those categories. Choose the Check None button to clear the list,



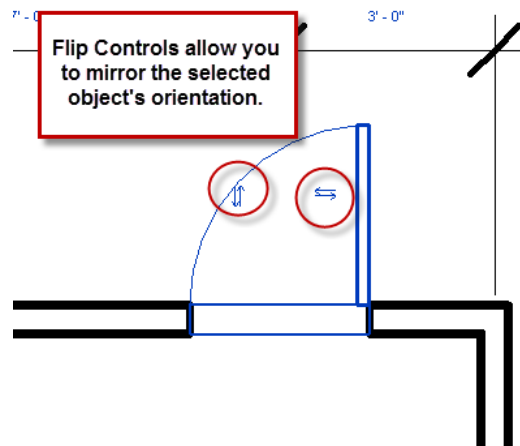
choose the categories you want and then pick OK to apply the current selection criteria and close the dialog box. Only elements in the filtered categories will remain in the selection set.

When multiple items are selected, you can also use the Selection Control window in the Properties palette to access the properties for any selected category.

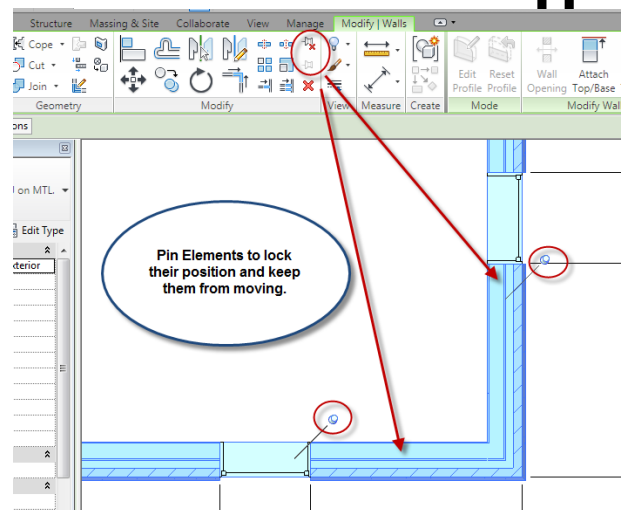
Create Chain selections of end-connected wall or line segments by highlighting an element and pressing TAB to highlight the entire chain. Pick to select all highlighted elements.

When you select an element, various controls and grips will appear on or near the element which may be used to move or resize it. Different types of controls appear for different elements and in different types of views. Drag controls appear as blue filled grips at the ends of lines and wall segments (in plan views). Picking and dragging these control points will change the endpoint location for the segments attached to that grip. In an elevation or 3D view, the controls display as arrows indicating Shape Handles which may be used to resize or reshape the selected element.

Flip Controls are double arrow icons which appear on some elements and are used to change the orientation of an element by mirroring its position. Flip controls are used to change the orientation of wall to flip the exterior side, to mirror a window within a wall, or to change the swing and hinge directions for a door.

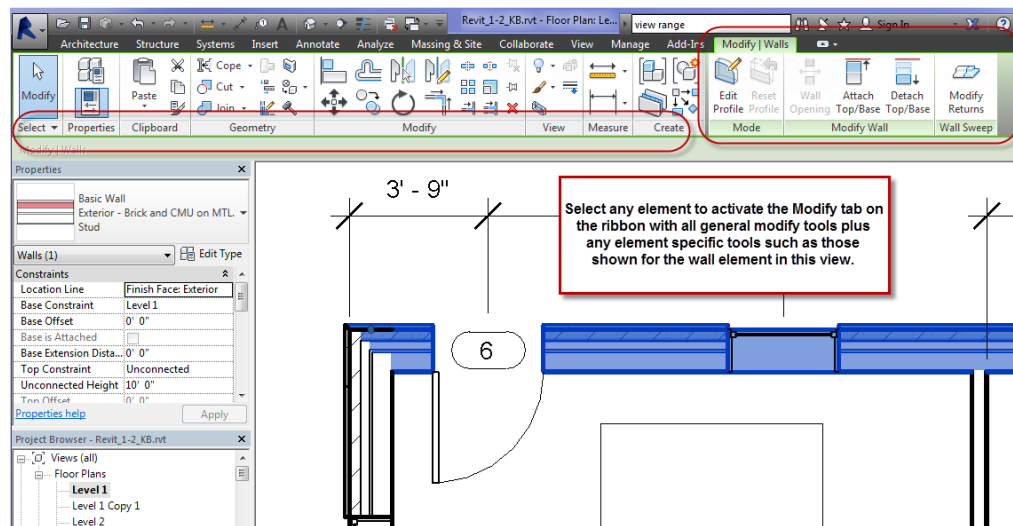


Pin Controls allow you to lock down an element to prevent it from moving. Pins do not constrain one element to another, but lock its position in space so it cannot be moved until it is Unpinned. To pin one or more elements, make the selection and pick the Pin tool from the Modify panel. You might want to Pin your structural grid or if you are doing an addition to an existing building, you could pin it down to ensure that it is not accidentally moved.

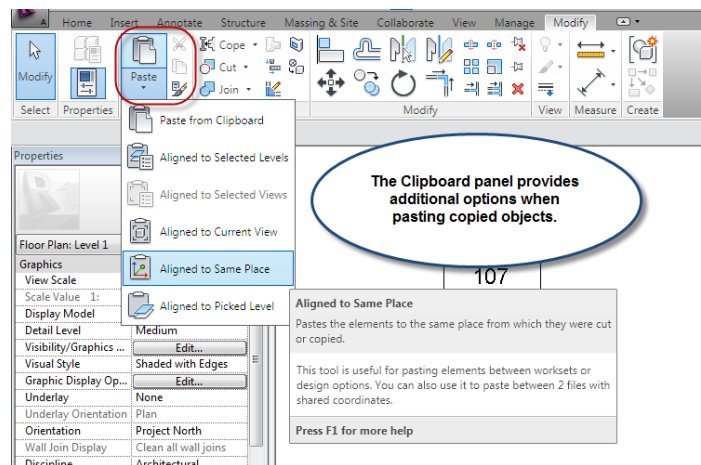


Use the Undo tool to cancel the most recent action. You can use the CTRL-Z keyboard shortcut or the Undo icon on the Standard toolbar. Selecting the dropdown arrow beside Undo tool allows you to undo multiple commands in single step. To Redo steps which have been Undone with the Undo command use the Redo tool, or Redo pulldown on the Standard toolbar. CTRL-Y will also Redo actions.

The Modify tab on the Ribbon provides access to a series of general tools for editing geometry, modifying elements, measuring and dimensioning, and creating parts, assemblies, and groups. The modify tab will automatically activate whenever you select one or more elements. You can also switch to the



Other familiar tools on the Modify|Element tab of the Ribbon include the Cut, Copy, and Paste commands which are used in many software programs to create duplicates of existing objects. The usual keyboard shortcuts, CTRL-C for Copy, CTRL-V for Paste, and CTRL-X for Cut work for these options. When you are pasting elements, look in the Paste dropdown menu for advanced options allowing you to paste the copied object into the same coordinates on one or more specific levels.



The cursor menu provides two options when an object is selected, that can be very useful including Create Similar and Select All Instances. Create Similar can also be accessed from the Ribbon or with the shortcut CS. Select All instances uses the shortcut SA.

The **Move** tool allows you to move objects with more precision than can be attained with the interactive pick and drag method of moving selected objects. Picking and dragging an object to define the move point makes it more difficult to specify precise dimensions for move displacements. The Move tool lets you use Object snaps such as endpoints, midpoints, etc. to precisely align one set of objects to other existing elements or references.

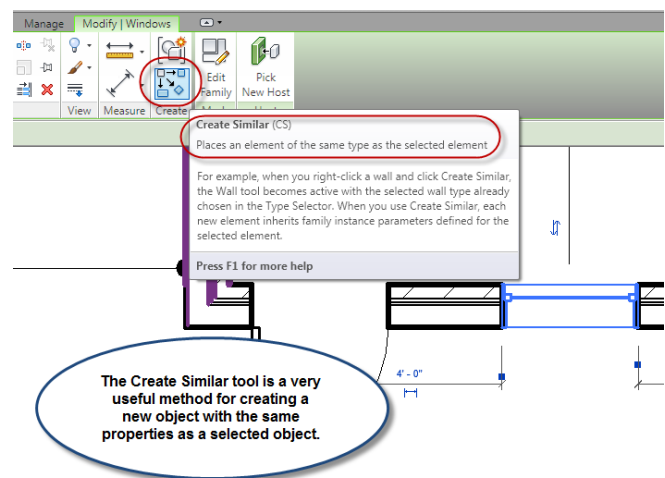
While moving objects the Options bar will show options for constraining the move in a single horizontal or vertical direction. (Ortho) as well as a Disjoin option and also a Copy option. Holding the Shift key will also constrain moves or copies to a horizontal or vertical direction.

Use the arrow keys to Nudge selected objects in small increments in a vertical or horizontal direction. The nudge distance will be dependent on the current zoom level.

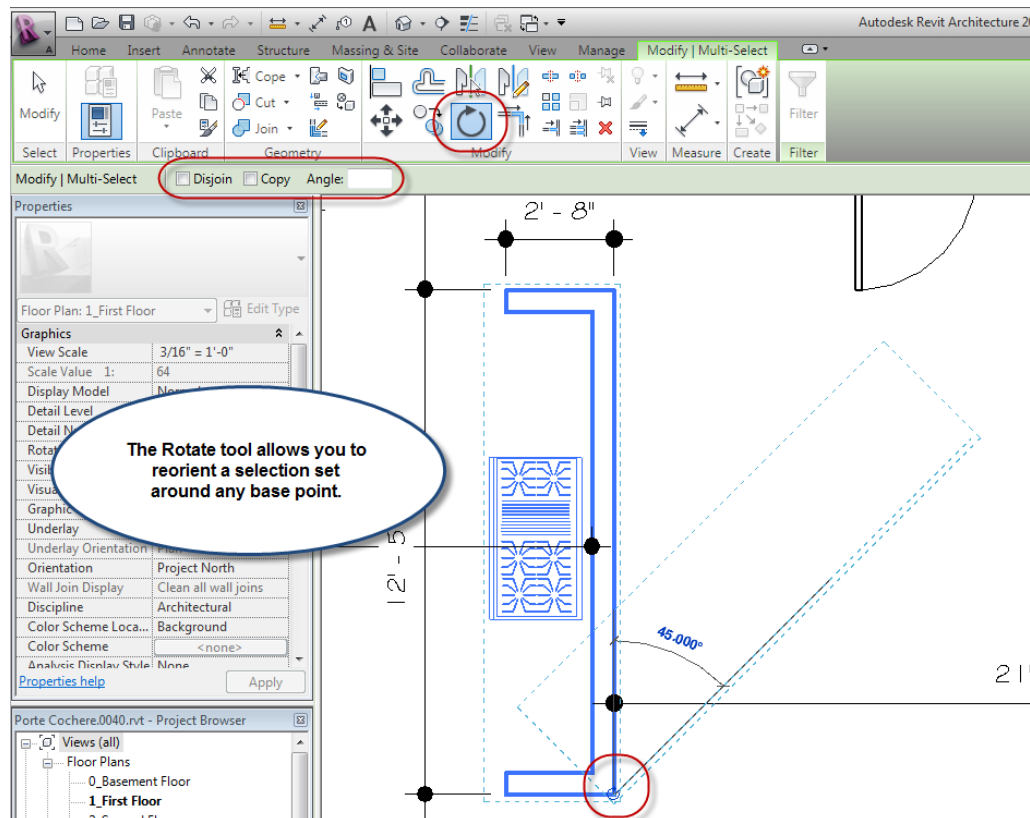
When you select certain elements such as furniture or other placed components, the Options bar will display a checkbox for *"Moves with Nearby Elements"*. If this option is enabled the selected elements will automatically maintain their relative position to nearby walls. Only elements with edges which are parallel to a wall will be affected by this option.

The **Copy** tool is very similar in function to the Move tool. It does not use the windows clipboard and is used to create copies in the current view only. If you want to create more than one copy at a time, choose the *Multiple* option on the Options bar. The Copy tool does not allow you to copy a hosted element such as a door or window to a different host wall.

The **Create Similar** is another useful method for creating a copy of a selected element. This tool is available for most Revit Architectural elements and allows you to place a copy of a hosted element outside the original host. For example a door may be "copied" to an adjacent wall. The Create Similar tool copies the general Type parameters for an element, but does not copy specific, instance parameters such as unconnected wall heights for a wall element.



Elements may be Rotated precisely with the Rotate tool on the modify panel. The default rotation base point will be defined at the centre of the selected elements but you can pick and drag the rotation origin symbol to any location to act as the base point. You can then define the rotation angle by picking two points or by typing in an Angle value on the Options bar.

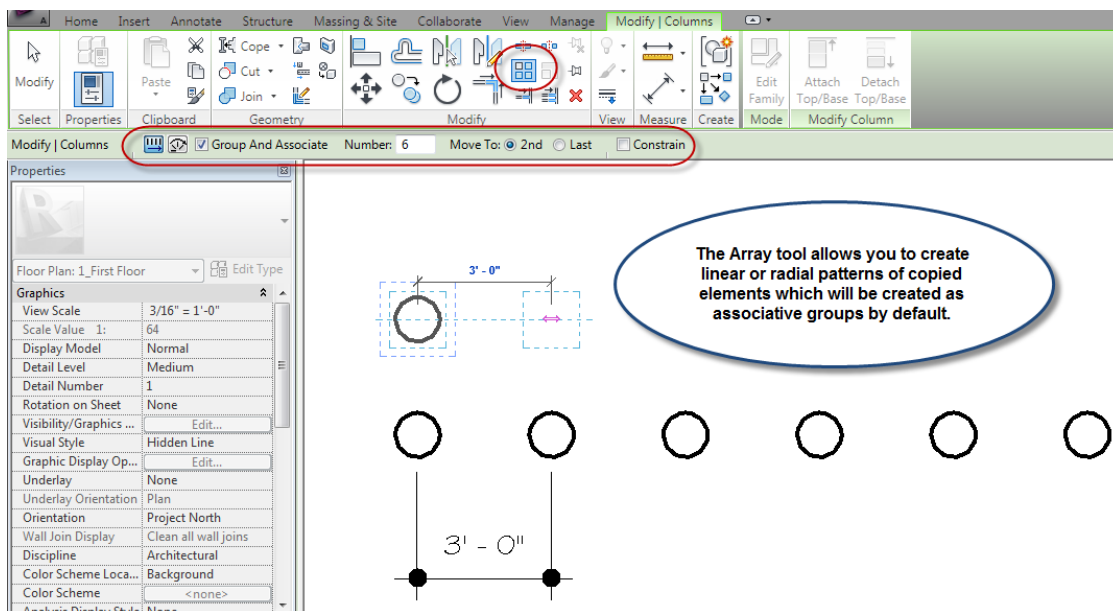


The Space bar may be used to Rotate elements as you are adding them and also after they have been placed. Selecting a door or window and pressing the Space bar will Flip the element through its available options. The Space bar may also be used to Flip the orientation of a wall. Selected components will be rotated in 90 degree increments.

The **Mirror** tool is another useful option on the Modify panel which allows you to create a reflected copy of one or more elements across an axis. The Mirror axis may be defined by selecting an existing edge or center reference in another element such as a door, window, wall, etc. or by selecting the Draw tool on the Options bar, you can pick two points to define the axis. If you do not wish to retain the original object, clear the Copy checkbox on the Options toolbar.

The **Array** tool allows you to create multiple copies of one or more elements in either a linear or a radial pattern. Arrays may be defined by specifying a number of elements in the array and a distance or angle between elements or an overall distance or angle to fill. To specify an incremental distance, choose the Move to 2nd option. To specify a total distance or angle to fill, choose the Move To Last. Both settings are found on the Options bar.

When you create an array, by default, the Group and Associate option will be selected. This option will create a relationship between the arrayed objects which can be modified after the array has been created. A grouped linear array will have a parameter for the number of elements in the array.



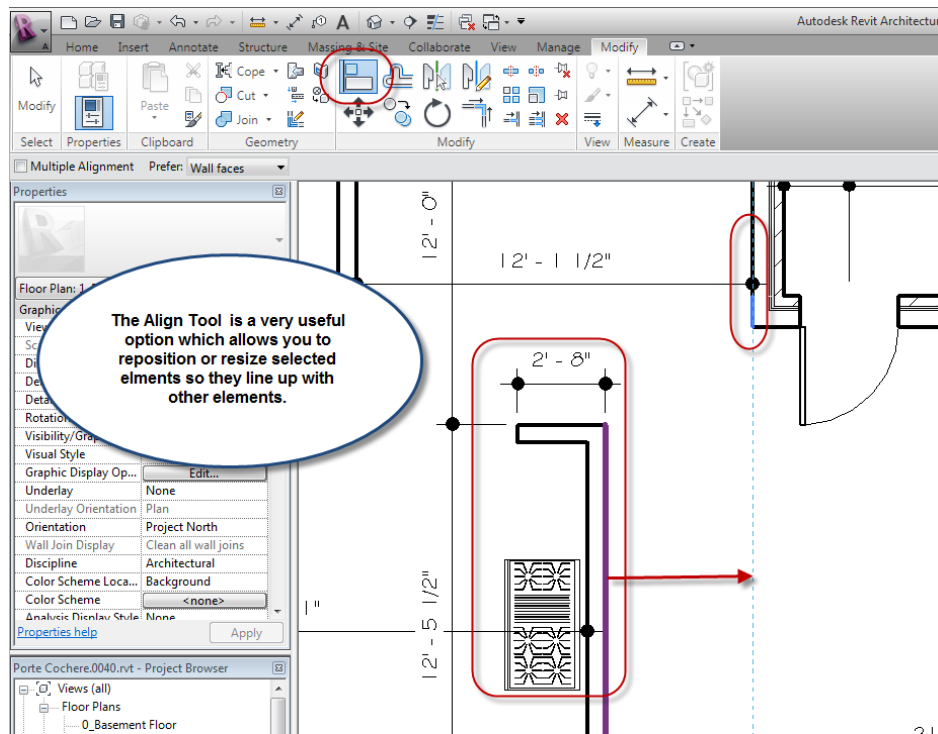
Radial Grouped arrays offer even more controls including the number of elements in the array, the angle between elements, the total angle to fill with elements, and the radius of the curve for the array.

Moving an element in a grouped linear array can resize the entire array. If the arrayed element is not hosted, dragging and element can also reorient the array of objects.

If you delete an element from an array, you will no longer have access to the parameter for the number of elements in the array and it will break the array into a series of model groups with one element in each group.

3. Editing Tools

The **Align** command on the Modify panel is an extremely powerful and useful feature which allows you to move elements against or in line with each other. After moving objects into alignment, a Padlock icon will appear, optionally allowing you to create a constraint between the elements. If constrained, when one element is moved, it will drag the aligned element along with it.



Unlike the previous editing tools, when you use the Align tool, you first choose the object you are aligning TO and then you select the object to move. When you choose the alignment references, Revit will automatically determine the center or face of elements in most cases.

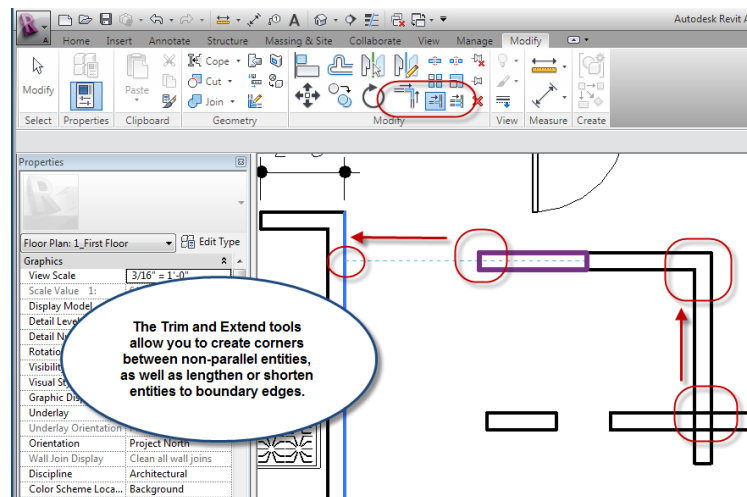
When aligning objects to walls, the Options bar will display an option to Prefer. Wall Faces, Wall Centrelines, the Face of the Structural Core or the Core Centreline.

The **Align** tool may be used to align surface patterns such as tiles or bricks with existing elements. Tile patterns for example may be aligned to coincide with a selected wall. The keyboard shortcut for Align is AL.

The **Trim** tool allows you to Trim or Extend one or more elements. As with the Align command, you first select the tool and then you select the objects to which you wish to apply the tool. When you select an object, the Modify panel on the ribbon will display three Trim tools: Trim Extend to Corner, Trim Extend Single element and Trim Extend Multiple Elements.

The trim extend to corner allows you to create a clean, closed corner from two non-parallel elements such as walls or lines. When you trim to a corner, pick both elements on the side you wish to retain.

The Trim Extend Single and Multiple options allow you to choose first a trim/extend boundary and then the element you wish to trim or extend. When you select the second element, Revit will display a blue dashed line to indicate the result of the operation.



The Extend options will be obvious but if you are familiar with the AutoCAD Trim command, the trim operation may seem unusual. Unlike AutoCAD where you select the boundary and then choose the portion to remove or trim off, Revit asks you to specify the boundary and then the portion you wish to retain.

The **Split** tool allows you to break a wall or line at a selected point. If you choose the option to “Delete Inner Segment” on the Options bar, Revit will prompt you to select two points along the wall or line and will trim out and remove the portion between those points. Split with Gap allows you to preset a gap size of up to 12 inches to create with a single pick. To combine two wall segment after splitting, pick one wall and then drag the control grip over the endpoint of the second segment.

The **Offset** command allows you to move or copy elements in a concentric or parallel manner. The offset distance may be specified on the Options bar or, if you choose the Graphical setting, you can specify two points to define the offset distance after first selecting the object to offset. To offset an entire chain of elements, highlight the first element, press TAB and then pick to offset the entire chain.

Exercise Notes

In the following exercise you will learn how to apply dimensions and constraints to your preliminary model to practice how to define relationships between elements. You will also practice manipulating elements with various editing tools and control features.

1. Open the project you were working on in lesson 2. If level one is not active, double click this level in the Project Browser to make it current. Type ZF to Zoom the view to Fit.
2. Start by defining the overall dimensions for the building footprint and locking them. From the Quick Access Toolbar, choose the Dimension tool. On the Options bar, choose Wall Faces and Pick Individual References. Select the face of the brick component on the lower, horizontal wall on the left side and then the same face on the horizontal wall at the top of the plan. Note that the face of the brick is not the outermost line in the wall but actually is the second edge in towards the interior. This is because we are using a complex wall style with a sill element between the block on the lower section of wall and the brick on the upper section of wall.(If you switch into the default 3D view and zoom in on a corner of the building, you can confirm the presence of this element.) While you are adding dimensions, use the wheel on your mouse to zoom in and out as required. After you select the two brick faces, drag your cursor away from the building and pick a point to locate the Dimension.
3. After you place the dimension, the dim value will appear in blue and a padlock icon will appear below the dimension. The dim value should be 38 feet, but if not exactly that value you can select one the walls and then change it.
4. Pick the wall at the front of the building and the dimension value should highlight in blue. If it doesn't highlight automatically, select the Activate Dimensions button on the Options Bar and it should change color. Pick the blue dimension value and it will highlight in a field where you can type a new value. Set the distance to 42 and hit enter. The wall will move, remain selected, and the dim value will still be blue. Take note of the square footage shown on the Room Tag in the adjacent office. Pick the dim value again and change it to 39 and hit enter. The wall will move again and the square footage shown will automatically update.

5. When a dimension runs between two objects and you change the dimension value, the selected element will be the one that moves to reflect the new distance. Hit ESC twice to clear the current selection and pick the other dimensioned wall at the back of the building. If the dimension text does not turn blue, it cannot be modified and you will need to choose the Activate dimensions button on the Options Bar. When dim text is editable, change the value to 44 and hit enter. This time, the wall at the back of the building will be the one that moves. Pick the dim text again and change it to 42 to pull the wall back down.
6. When you add a dimension, a dimension lock icon will appear allowing you to lock the dimension value right away. If you need to manipulate the dimensioned element as we have just done, to move it to the correct distance, the lock will not appear until you select the dimension. With the wall still highlighted, pick the dimension, to switch the selection and then pick the lock icon below the dimension to toggle it on and lock the value.
7. Pick the dimensioned wall at the back of the building and if no dims appear, choose Activate Dimensions. The 42 foot dimension will remain black indicating it cannot be modified. Select the wall at the front of the building and try the same thing. The 42 foot dimension cannot be changed.
8. Add a second dimension between the inner face of the front wall and the closest face on the wall at the North side of the office. Select the front wall and change the value of the highlighted dim to 16. Since the exterior wall is selected, it does move to make the office length 16 feet, but because the back wall is locked at a distance of 42 feet, it is also shifted to maintain this distance. With the wall still selected, change the value to 14 and then back to 16 and watch how the front and back exterior walls shift back and.
9. Add third dimension between the front exterior wall and the inset exterior wall containing the front door. Position the dim to the left of the front door but do not lock it.
10. We want to keep the 16 foot office, but we also want to change the dimension by the front door to a reasonable value. Perhaps, 8'-0". The solution is to remember that the wall you select will be the one that moves when you change the dim value. If we select the wall that is hosting the front door, it will move and the office dimension will be maintained. Try it now. Pick the wall with the door, activate its dimensions, and change the value to 8 and hit enter. Change it to 10 and hit enter again to see that only the selected wall is moving. Hit CTRL-Z twice to Undo two steps and revert to the original dimension.

11. To see what can happen when you don't think about what is selected and what is constrained to other elements, let's try it the wrong way. ☺ During this exercise, if any warning boxes appear telling you that an insert conflicts with a wall, just click in the drawing area to close the warning. (It happens if the end of a wall runs into a door opening.)
12. Pick the bottom exterior wall, and change the dim value to the front door wall to 8 feet. It moves the exterior wall so the distance to the front door wall is the correct 8 feet, but the office is now the wrong size.
13. Pick the same exterior wall to activate its dimensions again. This time pick the office dimension and change its value back to 16. Now, we lose the 8 foot dim. Okay. We'll lock the 8 foot dim first. CTRL-Z to get the 8 foot dim back. Pick the dim and lock it.
14. Pick the exterior wall at the bottom of the office and activate the dimensions. Change the office dimension to 16 again. Because the exterior wall is the one selected, and two other exterior walls have a locked dimension to the selected wall, the entire building shifts up to resize that office! I think you'll agree, the way we did this back in step 10, when we planned it, worked much better.
15. At this point, it is very likely that the shifting around of walls has created a conflict between some of the walls and one or more doors or windows. These are easy to fix by picking and dragging the door or window away from the conflicting wall. (or vice versa depending upon what is already dimensioned and locked or constrained. You should be able to select an element, hold down your mouse button, and drag it to a new position all in one step. Be careful as sometimes this option will lead to inadvertent moves when you select objects.
16. Select the 16 foot dimension inside the office and lock it. If any doors or windows around the office are conflicting with walls, move them by picking and dragging them to the correct location.
17. Take a look at the doors and windows around the office. Are all of the windows oriented to the same side of the wall? Pick one of the windows to select it. Pick the blue, Flip arrows which appear on one side of the window to change the side of the wall on which the window is placed. With the window selected, press the Space bar and it will also flip the window. Ensure all of the windows are oriented to the outside face of the exterior wall.
18. Try picking the door to the office and toggling the orientation of the door through its four possible Swing and Hinge configurations. You can do this either by picking the two sets of blue flip arrows, or by selecting the door and repeatedly pressing the space bar. When the door is in the correct direction, opening into the office and against the north wall, zoom in to the door.

19. Pick the door and then pick the witness line control bar on the temporary dimension at the top of the door to toggle the witness line location between the centre and the face of the opening. Toggle the witness line at the wall to the face closest to the door. Pick the dim value and change it to 4". Make sure you type the "mark to indicate inches, as just a number 4 will indicate 4 feet with the default unit settings.
20. To lock this relationship between the door and the adjacent wall, add a permanent dimension and lock it. As soon it is locked, hit the Delete key and a warning dialog will appear indicating you are deleting a constrained dimension. Pick OK to finish the delete operation but still retain the 4 inch offset constraint between the door and the wall. This method will allow you to create dimensional constraints in a number of locations in the design but only display an actual dimension in one location.
21. To see how the door will move with the wall, unlock the 16 foot dimension inside the office, and reposition the interior wall by picking it and dragging it to the North. The door will move with the selected wall to maintain the 4 inch dimension. When you pick the wall, it will display a dashed line and a lock symbol to indicate the constraint between the door and the wall. Set the dimension back to 16 feet and then lock it again. With nothing selected, pick the Reveal Constraints tool on the View control bar. Red dimensions will appear wherever constraints have been added. Toggle the Reveal constraints back off.
22. So far, our building has been able to shift its exterior walls to reposition or resize the building perimeter without regard to a fixed location. Locking the position of your building to keep it at a certain location can be done with the Pin tool. If we were first creating a structural grid for this building, we could Pin the grid and then constrain the walls to the grid. In this example we don't have a structural grid, but we can still lock the building down and anchor its position by Pinning one of the exterior walls. Select the 42 foot wall which we dimensioned first. On the Edit toolbar choose the Pin tool. Repeat for the adjacent exterior wall at the front of the building. This corner of the building is now locked down and the walls will no longer move. If you select either of the pinned walls you will see that the Activate dimensions button is no longer available. If you try to move the walls by picking and dragging, you'll see that they no longer respond.

23. Toggle the Reveal Constraints tool again. No symbols appear that are related to the Pinned walls. Pins are different than constraints. Pins will not only keep you from moving an element, they can also restrict the types of edits that can be applied to an element. No more than one Pin should be added to a project. Select the front wall and pick the Pin icon to unpin it. After you Pin an object, even if you Unpin it, the pin icon remains. To get rid of it, delete the once-pinned object, and then hit CTRL-Z to undo and bring it back. The pin icon will be gone.
24. Zoom in around the front of the building on the left side. Type DI to access the Dimension tool and then pick the left face of the building, the centre of the window, and then the outside face of the next exterior wall to create a multi-segmented dimension locating the window relative to the walls on either side. Pick a point to place the dimension below the exterior wall and then pick the EQ equality symbol to toggle the equality constraint on. The window will reposition to the exact centre of the wall in which it is hosted and the dimension values will change to EQ.
25. Add a single dimension to show the overall length of the wall hosting the window. Select the short exterior wall on the right side to enable the dimension value for the newly created dimension. Change the value to 15 and then again to 17 and watch how the window continues to shift to maintain its position in the middle of the wall.
26. Zoom out so you can see the width of the building. Pick the last dimension you created and on the Options Bar choose Edit Witness lines. Each of the existing witness lines will highlight and a new witness line will appear attached to your cursor. Pick the outer faces of each of the remaining exterior vertical walls to change the single dimension to a multi-segmented dimension showing the widths of each of the three sections of the building. After the last witness line has been added, pick in an empty area to complete the operation. (Do not cancel or hit escape to finish or the witness lines will be removed.) Pick the Equality symbol to modify the width of the three sections to the same distance.
27. Draw an overall dimension showing the entire width of the building. Pick the main exterior wall on the right side of the building so you can modify the overall building width with the last dimension created. Set the dimension value to 58. Change it to 54 and then to 52. Note how each of the three sections of the building shift to maintain their equality and as the individual sections change width, the equally constrained window also moves at the same time to maintain its own centered position in the wall.

28. After using equality constraints, you have a few choices as to how to deal with them since you probably don't want too many EQ values showing instead of actual dimension values. Also, where we are showing an overall dimension we do not want to show all of the incremental dimensions as well. The last dimension in a string is left out as the value can be calculated by subtracting the other increments from the overall value. If you wish to maintain the actual Equality constraint but not show all of the dimensions, delete the dimension but retain the constraints as we did with the four inch door opening offset. After deleting the Equal dimensions, draw new dimensions to show the distances where required. The other option is to toggle the equality constraint off after moving the objects and then edit the witness lines to remove the last witness line in the string.
29. If you remove equality constraints, and wish to keep the elements from moving, lock the dimensions by picking them and toggling their lock icons.
30. Create a set of equality constraints between the front door, the two adjacent windows, and the adjacent exterior wall faces.
31. Zoom around the front section of the building so you can see the horizontal walls along the South side. Type AL or pick the Align tool from the Tools toolbar. Pick the exterior face of the lower exterior wall on the left side to define the "Align To" reference. Pick the exterior face of the lower exterior wall on the right side of the building and it will shift down to perfectly align with the first wall. A dashed line and a lock icon will appear allowing you to create a locked alignment constraint by picking the lock. Repeat the process with the office walls to make the lower offices on both sides of the building, the same size.
32. Another useful place to create alignments is between the faces of interior walls and exterior walls such as at the intersection of the two, main North/South interior partitions and the exterior walls on either side of the front door. It is likely that even if they were initially drawn in the correct alignment, the resizing of the building has changed their locations. Zoom in to the connection between the interior partition and the exterior wall. Type AL and pick the inside face of the vertical exterior wall and then the corresponding face on the interior partition. Lock the alignment. This type of lock alignment can even be added when the two elements are already aligned. Create the constraint with both North South walls.

33. Add 4" door offset constraints to the remaining interior doors. Continue to constrain and dimension the remaining elements, moving them into the positions shown on the lesson handout drawing.
34. After all dimensions are in place, pick and drag the room tags into the middle of the rooms. As the tags are repositioned use the Smart Alignment lines (dashed green lines) to align the tags between rooms. These lines will appear when moving many types of elements.
35. Save and close the Project file. Don't forget to back up your work to a removable disk for safekeeping. We will continue with this project in the next lesson.

